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(54) **MARKING TABS WITH A TWO DIMENSIONAL CODE**

LASCHENMARKIERUNG MIT ZWEIDIMENSIONALEM CODE

MARQUAGE DE LANGUETTES AVEC UN CODE BIDIMENSIONNEL

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(73) Proprietor: **Crown Packaging Technology, Inc.
Alsip, IL 60803 (US)**

(72) Inventor: **RAMSEY, Christopher, Paul
Wantage
Oxfordshire OX12 8DP (GB)**

(74) Representative: **Marks & Clerk LLP
15 Fetter Lane
London EC4A 1BW (GB)**

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Description

FIELD OF THE INVENTION

[0001] This invention relates to containers, and more particularly to metal containers and beverages and producing markings on same.

BACKGROUND

[0002] Two piece metal beverage cans include a can body on which a can end is attached by a seam. Commercial two piece beverage cans are formed by a drawing and ironing process that forms the body sidewall integral with the base. Three piece metal cans include a cylindrical body, each end of which has a can end attached by a seam.

[0003] Two piece beverage cans are produced in vast quantities for beverages and foods use; three piece beverage cans are produced in vast quantities for food uses. Accordingly, the components of the cans must be produced at high speeds.

[0004] Conventional beverage cans and many easy open food cans have pull tabs. Pull tabs are formed from metal sheet in a tab press. Because of the quantities required, conventional tab presses form multiple tabs at once in lanes of two, three, or four tabs.

[0005] Typically, a pre-lacquered sheet of aluminum is fed from a coil into a shell press to form the can end shells. A pre-lacquered strip of aluminum is fed from a coil into a tab press to form the pull tabs. The shells and pull tabs are combined in a conversion press to form the unseamed can end.

[0006] Decoration of can ends, especially pull tabs, is known. For example, United States Patent Number 6,105,806 discloses laser etching or removal of portions of a coating on a pull tab. United States Patent Number 6,498,318 acknowledges difficulties in marking metal cans and discloses ablating metal pull tab stock.

[0007] US Patent Number 9,187,221 discloses marking on a can end and tab of a two dimensional code by applying a laser to the coated substrate to change an appearance of at least a portion of a photonically active component substantially without burning, etching, or ablating the lacquer, thereby forming an image. Preferably, a CO2 laser is employed that has a beam width that is less than approximately 50 microns (1 micron = 1 micrometer), more preferably no more than approximately 30 microns, more preferably no more than approximately 10 microns, and preferably approximately 5 microns. Accordingly the image may be formed by dots that have a dimension of less than approximately 50 microns, preferably no more than approximately 30 microns, more preferably no more than approximately 10 microns, and preferably approximately 5 microns. Accordingly the image may be formed by dots that have a dimension of less than approximately 50 microns.

[0008] JP 2011 020701 (Taguchi) discloses marking

on a flap that is separated from the structural portion of the tab by fold lines. After marking is applied to the flap, it is folded over the structural portion of the tab to form a cover.

[0009] QR codes are the most frequently used code type for applications that are read by smartphone scanning software. Conventional QR codes take in excess of 200 ms to write by conventional laser marking.

[0010] The inventors are aware of a commercial, conventional system for laser etching pull tabs that includes a CO2 laser that often operates at about 100W. Each lane of a tab press has its own laser such that the tab press can operate at about 700 tabs per minute with a laser having a resolution or dimension of approximately 100 microns (1 micron = 1 micrometer). Typically, a dark colored lacquer is removed by the laser to expose bare aluminum in the form of a simple logo or a few characters. The limitation on the process speed is also a limitation on the amount of decoration.

[0011] Laser marking of coatings is employed for flexible and card packaging for various marking applications. Typically, a thermally active pigment is loaded into a transparent or light colored lacquer, and a CO2 laser induces a color change. For example, a laser may be applied to a white lacquer label to display black text. Laser marking systems of this type are available from Sun Chemical, under the trade name Sunlase and employ a 100 micron (micrometer) YAG laser.

[0012] Conventional laser application to tab or other metal can substrates usually require a very high beam intensity and thus the use of high powered fibre lasers, for example 20W or 40W with a small focal length, for example 180 mm in order to etch a coating or metal substrate. As a result, the laser markings usually have characteristic dimensions of much less than 200 microns (1 micron = 1 micrometer), typically only 50 to 150 microns.

[0013] WO2014150647 describes marking a matrix barcode on coil stock using a laser.

SUMMARY

[0014] According to the present invention there is provided a method for marking codes on a beverage can tab structure as defined in claim 1. Also described herein is a method for marking a code on a beverage can tab structure which includes a combination of spot size (for forming an element of a two dimensional code), code area, matrix size (that is, number of elements), speed of forming the code, and code readability to achieve a commercial viable method that provides sufficient capacity of unique codes for use in the beverage can industry. The present invention is not intended to be limited by the particular combinations set out in the specification. Rather, the claims are intended to define the scope of the invention.

[0015] The method for marking a code on a beverage can tab structure includes forming a two dimensional code on a surface on a body portion of the beverage can

tab structure, which encompasses both marking the tab after it is formed in a tab press and marking the tab stock before it enters the tab press. The elements of the code preferably are formed in a coating that is dark by applying an approximately round laser light forming spots. The term round is used herein to refer to approximately circular at the plane (that is, the metal surface) on which the light is projected (that is, the spots). The spots preferably are formed one at a time such that the laser remains stationary until the spot is formed. Then, after forming a spot, the laser is moved and/or the tab structure is moved to another desired location for forming another spot. More than one laser may be used to form more than one spot at a time. The process is repeated until the desired code is formed.

[0016] The laser light preferably disturbs the coating, thereby forming light-colored spots that are approximately round and have a minimum diameter of at least 200 micrometers. The spots form a two dimensional code, preferably a Data Matrix Code, that is readable by a wireless communication device. Preferably the code area is less than 6 mm by 6 mm.

[0017] Consumer scannable codes of less than 6 mm square are conventionally problematic and are not currently used commercially in the beverage can industry because, the inventors surmise, two dimensional codes (especially QR codes, which is the most popular version used in packaging) have a resolution that is too fine to read reliably when placed in the small available area of commercial tabs, according to the conventional wisdom that a small code requires high resolution to achieve a high number of unique combinations of elements. In some circumstance using some embodiments of the disclosure, a custom app having built-in scanning software for a smartphone may be required.

[0018] The present invention is not limited to the 6 mm by 6 mm code size limit unless the limit is expressly set out in the claims. According to the invention the code is read within the given process time target of approximately 50 ms as defined in claim 1.

[0019] Thus, in some embodiments, a DMC code that is scannable by conventional wireless communication devices (regardless whether using conventional or customized scanning apps) enables a quantity of possible codes that is large enough to create a unique ID for the beverage can market.

[0020] Conventional codes require a quiet zone, thus would make the available space even smaller on the tab recess. Accordingly, an inverted code (that is, forming light colored elements on a dark background) enables the use of a code using the background surrounding the code as the quiet zone.

[0021] Also described herein is an unseamed beverage can end comprising a shell and a tab. The shell including a curl, a sidewall, a center panel, and a score in the center panel for forming a tear panel. The tab is attached to the center panel by a rivet. The tab includes a body portion that has a surface. The surface has a coating

that is dark; and a marking code on the coating. The marking code is a plurality of light spots achieved by a round laser light. Each of the plurality of light spots has a minimum dimension of at least 200 micrometers.

[0022] The plurality of light spots forms a two dimensional code that is readable by a wireless communication device.

BRIEF DESCRIPTION OF THE FIGURES

[0023]

Figure 1A is a perspective and schematic view of an end having a two dimensional code on the tab.

Figure 1B is a perspective image of an end having a preferred embodiment code.

Figure 1C is a bottom image of a tab having a two dimensional code.

Figure 2 is an image of tab stock formed into ends illustrating aspects of the present invention.

Figure 3 is an image of a two dimensional code illustrating an aspect of the present invention.

Figure 4 are images of spots of a code formed according to an aspect of the present invention.

Figures 5A and 5B are images of a code that is formed by spots, wherein each element is formed by multiple spots.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0024] Figures 1A schematically illustrates a beverage can 10 that includes a can body 12 and a can end 14. The can end 14 may be seamed, as illustrated, or unseamed. An unseamed can end is disclosed in US Patent Number 9,187,221, entitled "Can Ends Having Machine Readable Information," filed on September 27, 2012. End 14 includes a center panel 20 and a chuck wall 22. The finished end also includes a pull tab 26 attached to the center panel 20 by a rivet. The pull tab 26 is shown in its fully actuated position after it has ruptured the score to create the pour opening. An image, such as a two dimensional code 28, is located on the underside of tab 26 such that it would be visible only after actuation of tab 26. The present invention is not limited to beverage can ends, but encompasses other ends, such as ends on food cans.

[0025] The tab on which the code is applied includes a nose, a heel, and a structural body between the nose and the heel. The structural body has a land through which a rivet can be attached to affixed the tab 26 to a beverage can. As shown, code 28 is formed directly on the structural body of tab 26.

[0026] Code 28 can be any two dimensional code capable of being read by a scanner or wireless communication device, such as an app for a commercial smartphone. The code may be of any type such as an Aztek code, a MaxiCode, a QR code, or, as illustrated in Figures 1B, 3, and 4, a Data Matrix Code ("DMC"). Each of these

codes is governed by standards, which a person familiar with code technology will understand.

[0027] As illustrated in Figure 1B, a preferred embodiment includes a beverage can 110 that includes a can body 112 and a seamed can end 114. End 114 includes a center panel 120 and a chuck wall 122. The finished end also includes a pull tab 126 attached to the center panel by a rivet. The pull tab 126 is shown in its fully actuated position after it has ruptured the score to create the pour opening. A code 128 is located on the underside of tab 126 such that it would be visible only after actuation of tab 126.

[0028] Tab 126 includes a heel 140, a nose 142 (shown as underneath center panel 120 in the figures because tab 126 is in its actuated position after opening a tear panel), a rivet island 144, and a panel 146. Tab 126 is actuated in a conventional way by lifting heel 140 to pivot the tab about the rivet such that nose 142 presses down on the tear panel.

[0029] Panel 146 is continuous or hole-less and flat to provide a substrate that is approximately 6 mm by 6 mm or less, with a tolerance of plus/minus 0.5 mm, which is helpful for positioning code 128. Thus, panel 146 is flat, which is used herein to mean conventionally flat and sufficient for efficient reading of codes by conventional, retail wireless communication devices, such as an iPhone 6 and the like including corresponding conventional scanning software or applications.

[0030] As illustrated in Figure 1B, panel 146 preferably is recessed or set off from a curled portion of the tab 126 and from an upper flat portion 130 by a pair of ledges or steps 132a and 132b. Panel portion 146, which bears code 128, and upper panel portion 130 form a continuous and hole-less surface between the curl portion of the tab 126 at the heel 140 and a cutout for rivet island 144.

[0031] The inventors have determined that DMC codes are preferred for marking tabs because of efficiency of data storage relative to space available under the tab. Code 128 in Figure 1B is a Data Matric Code ("DMC"), which is a two-dimensional matrix barcode consisting of black and white cells or modules arranged in either a square or rectangular pattern. Each module represents a bit, which can be encoded can be text or numeric data. DMC codes typically include two solid adjacent borders in an "L" shape, referred to a finder pattern, and two other borders consisting of alternating dark and light modules, referred to as a timing pattern. DMC codes may be governed by ISO/IEC standards, as will be understood by persons familiar with code technology.

[0032] A DMC code type also enables, or makes more effective, reading the code 128 on tab 126, in part because of its high redundancy of about 50% and error checking associated with DMC codes. The inventors have demonstrated that a DMC code can be produced at commercial production speed (that is, commercial speed) of sufficient quality to be reliably read by conventional smartphone cameras and the associated scanning software. The inventors surmise that other code types

may be possible.

[0033] As shown in the figures, DMC code 128 is a 14 by 14 two dimensional matrix of silver or light spots on a black background, which matrix is surrounded by the black coating. The spots as shown do not overlap. As best shown in Figure 4, the coating is disturbed to form a silver or light color. In some circumstances the coating is not removed from the metal substrate, which metal substrate preferably is not ablated or altered by the laser process. Preferably, the code 128 is at least a 12 by 12 element size and less than a 21 by 21 element size. The lower limit enables sufficient combinations of elements for use in the vast quantities common for beverage cans. The upper limit provides a sufficient dot size to enhance the ability for reading.

[0034] The method for forming code 128 can be applied to any tab structure. The term "tab structure" is used to refer to tab stock in a flat strip as it comes off the roll before it enters the tab press, finished tabs after exiting the tab press, and tabs after exiting the conversion press such that the tabs are affixed to commercial beverage ends. Figure 4 shows tabs in the state after the conversion press, which tabs are attached to a skeleton or remnant of the strip.

[0035] The spots preferably are formed by disturbing the dark coating. The inventors have demonstrated that a black lacquer coating can be disturbed such that it changes color or brightness. According to the invention the fluence of the laser is too low to cause vaporization of the coating as defined in claim 1. In this regard, the black coating absorbs the 1 micrometer laser wavelength common to fiber lasers. Coatings other than black can be employed so long as the coating is capable of absorbing 1 micrometer laser wavelengths in order to change color or brightness as described here. Further, other coatings that absorb other wavelengths, for example (without limitation) 10 micrometer wavelengths of CO₂ lasers, may also be employed.

[0036] The term "dark coating" is used herein to describe a black coating, and also encompasses other coatings that provide a sufficient change in color or brightness to appear to be a light spot relative to the coating when laser light is applied. Whether a coating constitutes a "dark coating" that can change color upon absorbing laser light of a given wavelength can be ascertained by routine experimentation in view of the present disclosure.

[0037] Code 128 is an inverted code such that it is formed by light spots on a dark background, rather than the conventional black squares on a white background. Conventional DMC codes require a 3 module wide white quiet zone around the code, but because the code is inverted the black coating itself forms the quiet zone.

[0038] Tabs 126 preferably are laser marked just prior to the conversion press during the portion of the cycle when the parts are stationary. At a tab making production speed of at least 650 ends per minute, with three lanes and one laser per lane, the stationary period is approximately 55 milliseconds (ms). Accordingly, code 128 is

applied in less than 75 ms, and preferably less than 65 ms, and preferably less than 55 ms to form the two dimensional code. Providing a unique code to each of 10 billion cans, which chances of guessing a code at random is very small preferably dictates, at least a 12 by 12 module code.

[0039] The method of forming code 128 includes forming spots having an appropriate size at an appropriate speed. Code 128 is formed of spots having a diameter of at least 200 micrometers, preferably 250 to 400 micrometers, and more preferably between 250 and 350 micrometers. In the embodiment, the spots are approximately 330 micrometers. In circumstances in which the spots are not round, the diameter values may be calculated by averaging the minimum and maximum dimensions through the geometric center of the spot to produce an average spot diameter.

[0040] To aid in reading, the spots preferably have an aspect ratio, which is defined as the ratio of the maximum dimension and minimum dimension of the spot taken through its geometric center, of no more than approximately 1.5, more preferably no more than approximately 1.3, and more preferably no more than approximately 1.2.

[0041] The laser employed has a focal ratio of between approximately 40 and approximately 70, more preferably between approximately 45 and approximately 65 and even more preferably approximately 50 and approximately 60 which values the inventors believe are relatively larger than those for conventional laser marking processes and provide a relatively large diameter large spot (described above) and good tolerance to out of focus errors. The "focal ratio" is the focal distance divided by the beam diameter measured at the final lens. The focal distance preferably is greater than 225 mm, more preferably, greater than 275 mm, more preferably between 300 and 375 mm, and for the embodiment shown approximately 330 mm.

[0042] The laser employed to produce the spots of code 128 in Figures 2 through 4 is a 70W, H- type fiber laser supplied by SPI Lasers under the tradename RedEnergy G4. The inventors surmise that a laser power of 40W or greater may be used. As a general rule, obtaining or seeking a uniform beam intensity profile is achieved in a specific plane. To achieve the spots of code 128 at commercial speeds, the beam has a "depth of field" attribute such that a perfect intensity distribution (that is a "top-hat" distribution) across the beam is not feasible. Accordingly, the laser in the examples is adjusted to be appropriately out of focus and includes optical aberration to obtain the desired beam attributes, including uniformity of intensity. In this regard, aberration and focus are used to create a wider, more uniform distribution, as will be understood by persons familiar with laser technology for marking. In the examples, several short high energy pulses, for example six, are used to progressively disturb the lacquer to achieve the desired effect. The laser is applied without active focusing or feedback.

[0043] Alternatively, as illustrated in Figures 5A and

5B, each element can be formed by several spots. In the embodiment shown, nine dots are formed by a laser to fill produce an element that can be read by a wireless communication device, as described above. Each of the multiple spots may be discrete, such that each spot does not overlap with adjacent spots, as shown in Figure 5A. Or each of the multiple spots may be formed such that it overlaps adjacent spots within the same element, as shown in Figure 5B. Each of the spots of Figures 5A and 5B may be formed by the laser process and equipment as generally described herein to achieve elements that are readable by wireless communication devices described herein.

[0044] The present invention is illustrated by the code and tab structure described herein. The present invention is not limited to the particular disclosure, but is only defined by the appended claims.

Claims

1. A method for marking codes (28, 128) on a beverage can tab structure comprising a plurality of tab body portions (26, 126), each body portion having a surface with a coating that changes color or brightness to appear lighter when laser light is applied, the method comprising the steps of:

(i) applying an approximately round laser light onto a first location on the surface of a tab body portion to achieve a light-colored spot, the fluence of the laser being too low to cause vaporization of the coating;
after the applying step (i), (ii) repeatedly applying the approximately round laser light onto other locations on the surface of the body portion of the beverage can tab structure to achieve other light-colored spots,
(iii) advancing the tab structure so that steps (i) and (ii) can be repeated for a next tab body portion,
wherein the applying steps (i) and (ii) are applied in less than 75 ms and the laser light in the applying steps (i) and (ii) changes the color or brightness of the coating, thereby forming light-colored elements having a minimum characteristic dimension of at least 200 micrometers, the elements forming a two dimensional code that is readable by a wireless communication device; and
reading, within a process time target of approximately 50 ms, the two dimensional code marked on a tab body portion.

2. The method of claim 1, wherein each element is formed from a single spot.

3. The method of any of the preceding claims, wherein

the steps of applying the laser light include employing a laser having a focal ratio of between approximately 40 and approximately 70, or between 45 and 65, or between 50 and 60.

4. The method of any of the preceding claims, wherein the code (28, 128) is no greater than 6 mm by 6 mm or no greater than 5 mm by 5 mm.
5. The method of any of the preceding claims, wherein the spots have an aspect ratio of no more than approximately 1.5, no more than approximately 1.3 or no more than approximately 1.2.
6. The method of claim 3, wherein a focal distance is greater than 225 mm or between 300 and 375 mm.
7. The method of any of the preceding claims, wherein the applying steps (i) and (ii) are applied less than 65 ms, to form the two dimensional code (28, 128).
8. The method of any of the preceding claims, wherein the applying steps (i) and (ii) are executed without active focusing of the laser.
9. The method of any of the preceding claims, wherein the applying steps (i) and (ii) are the coating is black such the code (28, 128) has no quiet zone surrounding the code.
10. The method of claim 1, wherein each element is formed from multiple spots, each one of the spots formed by a single application of the laser, each one of the spots being approximately round.
11. The method of any one the preceding claims, wherein the average diameter of the spots is at least 250 micrometers and no more than 400 micrometers, preferably at least 250 micrometers and no more than 350 micrometers.
12. The method of any one of the preceding claims, wherein the code (28, 128) is defined by at least 12 elements by 12 elements and no more than 21 by 21 elements.
13. The method of any one of the preceding claims, wherein the coating forms a dark border outboard of the two dimensional code (28, 128).

Patentansprüche

1. Verfahren zur Markierung von Codes (28, 128) auf einer Getränkedosen-Laschenstruktur, umfassend eine Vielzahl von Laschenkörperabschnitten (26, 126), wobei jeder Körperabschnitt eine Oberfläche mit einer Beschichtung aufweist, die ihre Farbe oder

Helligkeit ändert, um heller zu erscheinen, wenn Laserlicht aufgebracht wird, wobei das Verfahren die folgenden Schritte umfasst:

- 5 (i) Aufbringen eines annähernd runden Laserlichts auf eine erste Stelle auf der Oberfläche eines Laschenkörperabschnitts, um einen hellfarbigen Fleck zu erzielen, wobei die Fluenz des Lasers zu gering ist, um eine Verdampfung der Beschichtung zu verursachen;
- 10 (ii) nach dem Aufbringsschritt (i), wiederholtes Aufbringen des annähernd runden Laserlichts auf andere Stellen auf der Oberfläche des Körperabschnitts der Getränkedosen-Laschenstruktur, um andere hellfarbige Flecken zu erzielen,
- 15 (iii) Weiterbewegen der Laschenstruktur, so dass Schritt (i) und (ii) für einen nächsten Laschenkörperabschnitt wiederholt werden können,
- 20 wobei die Aufbringsschritte (i) und (ii) in weniger als 75 ms aufgebracht werden, und das Laserlicht bei den Aufbringsschritten (i) und (ii) die Farbe oder Helligkeit der Beschichtung verändert, wodurch hellfarbige Elemente gebildet werden, die eine kennzeichnende Mindestabmessung von mindestens 200 Mikrometern aufweisen, wobei die Elemente einen zweidimensionalen Code bilden, der von einer drahtlosen Kommunikationsvorrichtung gelesen werden kann; und Lesen, innerhalb eines Verarbeitungszeitziels von annähernd 50 ms, des auf einem Laschenkörperabschnitt markierten zweidimensionalen Codes.
- 25 2. Verfahren nach Anspruch 1, wobei jedes Element aus einem einzelnen Fleck gebildet wird.
- 30 3. Verfahren nach einem der vorhergehenden Ansprüche, wobei die Schritte des Aufbringens des Laserlichts das Einsetzen eines Lasers einschließen, der ein Öffnungsverhältnis von zwischen annähernd 40 und annähernd 70, oder zwischen 45 und 65, oder zwischen 50 und 60 aufweist.
- 35 4. Verfahren nach einem der vorhergehenden Ansprüche, wobei der Code (28, 128) nicht größer als 6 mm mal 6 mm oder nicht größer als 5 mm mal 5 mm ist.
- 40 5. Verfahren nach einem der vorhergehenden Ansprüche, wobei die Flecken ein Seitenverhältnis von nicht mehr als annähernd 1,5, nicht mehr als annähernd 1,3 oder nicht mehr als annähernd 1,2 aufweisen.
- 45 6. Verfahren nach Anspruch 3, wobei eine Brennweite größer als 225 mm oder zwischen 300 und 375 mm ist.

7. Verfahren nach einem der vorhergehenden Ansprüche, wobei die Aufbringschritte (i) und (ii) weniger als 65 ms aufgebracht werden, um den zweidimensionalen Code (28, 128) zu bilden. 5
8. Verfahren nach einem der vorhergehenden Ansprüche, wobei die Aufbringschritte (i) und (ii) ohne aktive Fokussierung des Lasers ausgeführt werden. 10
9. Verfahren nach einem der vorhergehenden Ansprüche, wobei die Aufbringschritte (i) und (ii) sind, die Beschichtung schwarz ist, sodass der Code (28, 128) keine den Code umgebende Ruhezone aufweist. 15
10. Verfahren nach Anspruch 1, wobei jedes Element aus mehreren Flecken gebildet wird, wobei jeder der Flecken durch ein einziges Aufbringen des Lasers gebildet wird, wobei jeder der Flecken annähernd rund ist. 20
11. Verfahren nach einem der vorhergehenden Ansprüche, wobei der durchschnittliche Durchmesser der Flecken mindestens 250 Mikrometer und höchstens 400 Mikrometer, vorzugsweise mindestens 250 Mikrometer und höchstens 350 Mikrometer ist. 25
12. Verfahren nach einem der vorhergehenden Ansprüche, wobei der Code (28, 128) durch mindestens 12 Elemente mal 12 Elemente und höchstens 21 mal 21 Elemente definiert ist. 30
13. Verfahren nach einem der vorhergehenden Ansprüche, wobei die Beschichtung eine dunkle Begrenzung an der Außenseite des zweidimensionalen Codes (28, 128) bildet. 35

Revendications

1. Procédé de marquage de codes (28, 128) sur une structure de languette de boîte de boisson comprenant une pluralité de parties de corps de languette (26, 126), chaque partie de corps ayant une surface avec un revêtement qui change de couleur ou de luminosité pour apparaître plus clair lorsqu'une lumière laser est appliquée, le procédé comprenant les étapes consistant à : 40
- (i) appliquer une lumière laser approximativement ronde à un premier endroit de la surface d'une partie de corps de languette pour obtenir un point de couleur claire, la fluence du laser étant trop faible pour provoquer une vaporisation du revêtement ; 45
- (ii) après l'étape d'application (i), appliquer de manière répétée la lumière laser approximativement ronde à d'autres endroits de la surface de 50
- la partie de corps de la structure de languette de boîte de boisson pour obtenir d'autres points de couleur claire, 55
- (iii) faire avancer la structure de languette de sorte que les étapes (i) et (ii) peuvent être répétées pour une prochaine partie de corps de languette, dans lequel les étapes d'application (i) et (ii) sont appliquées en moins de 75 ms et la lumière laser dans les étapes d'application (i) et (ii) change la couleur ou la luminosité du revêtement, formant ainsi des éléments de couleur claire ayant une dimension caractéristique minimale d'au moins 200 micromètres, les éléments formant un code bidimensionnel qui est lisible par un dispositif de communication sans fil ; et lire, au sein d'un cible de délai de traitement d'approximativement 50 ms, le code bidimensionnel marqué sur une partie de corps de languette.
2. Procédé selon la revendication 1, dans lequel chaque élément est formé à partir d'un seul point.
3. Procédé selon l'une quelconque des revendications précédentes, dans lequel les étapes d'application de la lumière laser incluent l'emploi d'un laser ayant un rapport focal compris entre approximativement 40 et approximativement 70, ou entre 45 et 65, ou entre 50 et 60.
4. Procédé selon l'une quelconque des revendications précédentes, dans lequel le code (28, 128) ne dépasse pas 6 mm par 6 mm ou ne dépasse pas 5 mm par 5 mm.
5. Procédé selon l'une quelconque des revendications précédentes, dans lequel les points ont un rapport d'aspect d'au plus approximativement 1,5, d'au plus approximativement 1,3 ou d'au plus approximativement 1,2.
6. Procédé selon la revendication 3, dans lequel la distance focale est supérieure à 225 mm ou comprise entre 300 et 375 mm.
7. Procédé selon l'une quelconque des revendications précédentes, dans lequel les étapes d'application (i) et (ii) sont appliquées moins de 65 ms, pour former le code (28, 128) bidimensionnel.
8. Procédé selon l'une quelconque des revendications précédentes, dans lequel les étapes d'application (i) et (ii) sont exécutées sans focalisation active du laser.
9. Procédé selon l'une quelconque des revendications précédentes, dans lequel les étapes d'application (i)

et (ii) sont le revêtement est noir de sorte que le code (28, 128) n'a pas de marge entourant le code.

10. Procédé selon la revendication 1, dans lequel chaque élément est formé de plusieurs points, chacun des points étant formé par une seule application du laser, chacun des points étant approximativement rond. 5
11. Procédé selon l'une quelconque des revendications précédentes, dans lequel le diamètre moyen des points est d'au moins 250 micromètres et d'au plus 400 micromètres, de préférence d'au moins 250 micromètres et d'au plus 350 micromètres. 10
15
12. Procédé selon l'une quelconque des revendications précédentes, dans lequel le code (28, 128) est défini par au moins 12 éléments par 12 éléments et au plus 21 par 21 éléments. 20
13. Procédé selon l'une quelconque des revendications précédentes, dans lequel le revêtement forme une bordure sombre à l'extérieur du code (28, 128) bidimensionnel. 25
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40
45
50
55

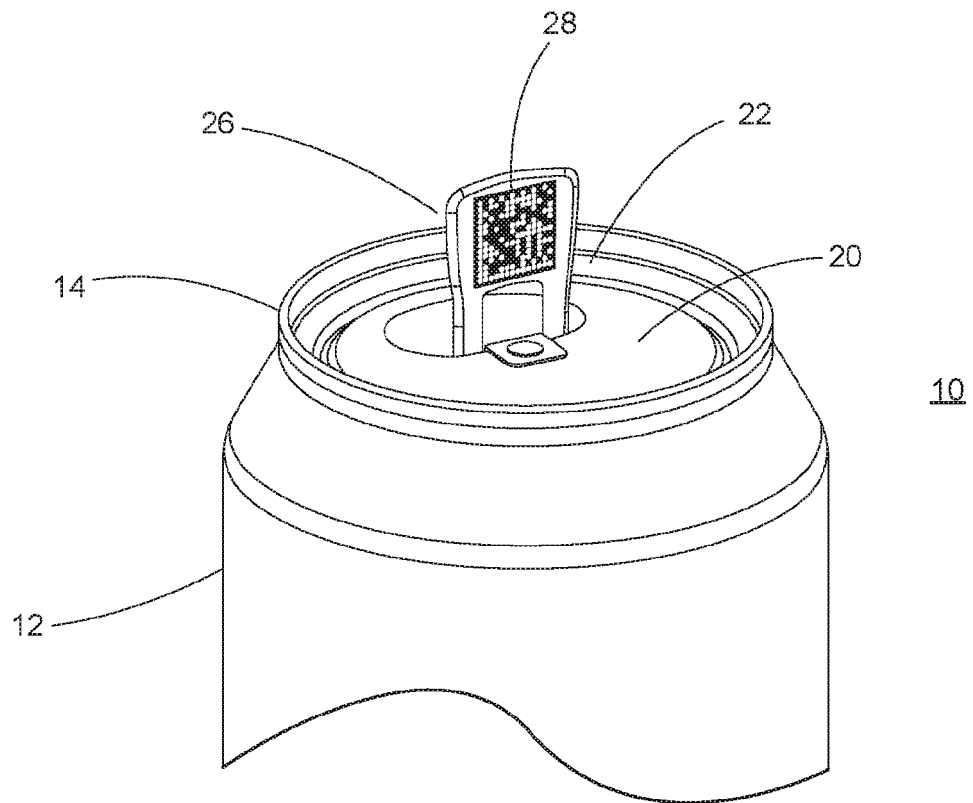


FIG. 1A

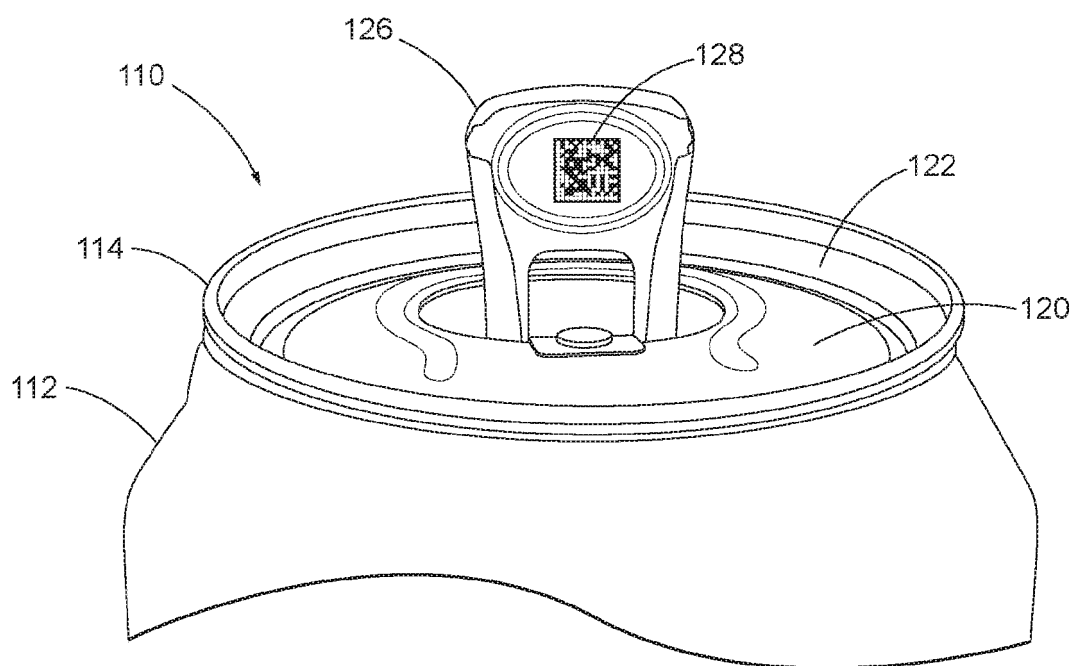


FIG. 1B

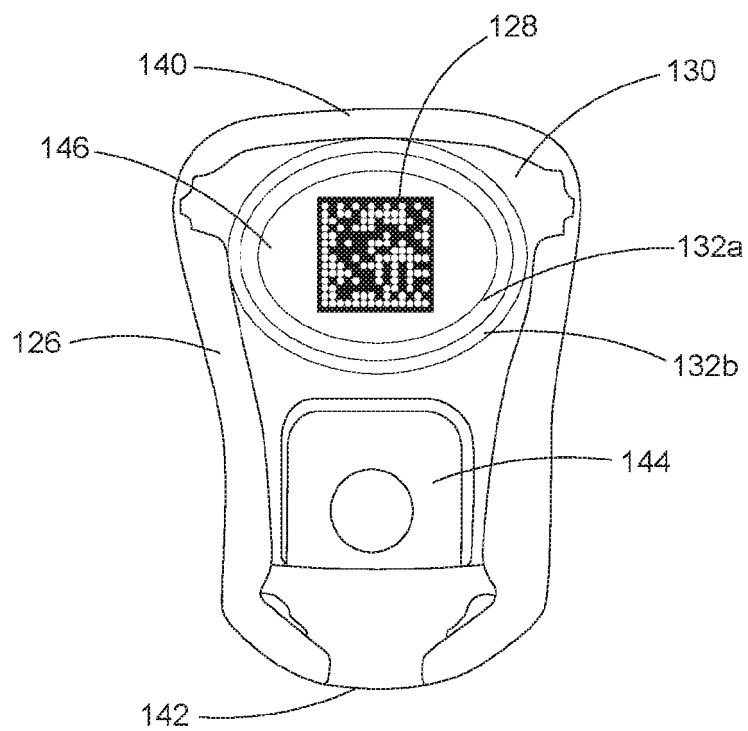


FIG. 1C

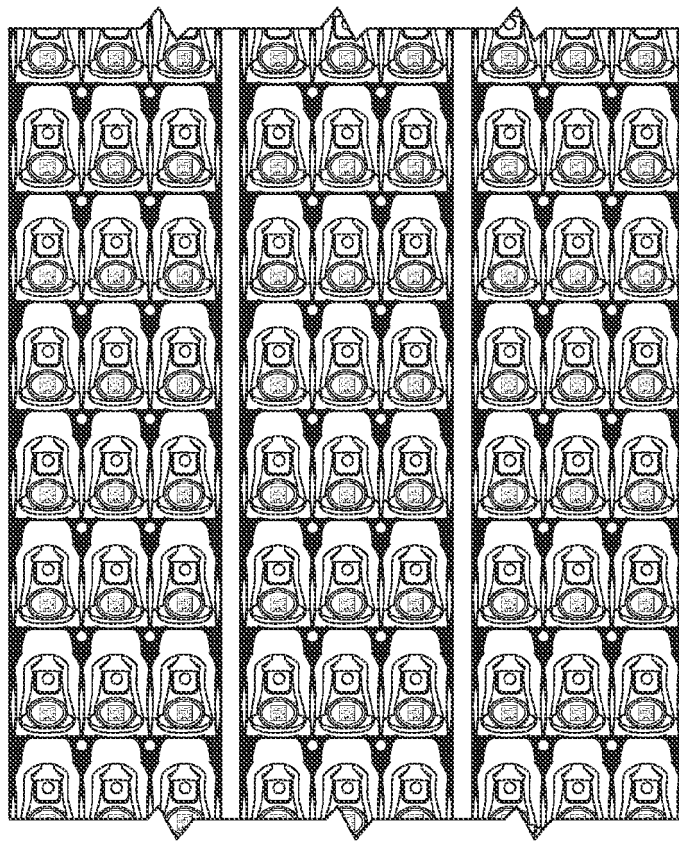


FIG. 2

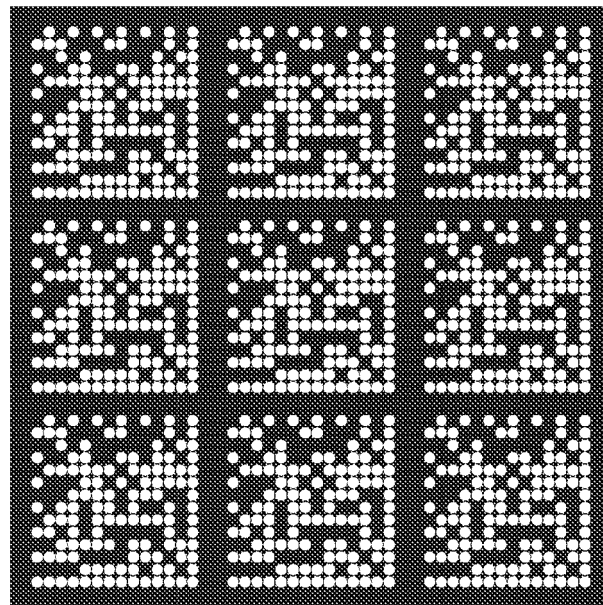


FIG. 3

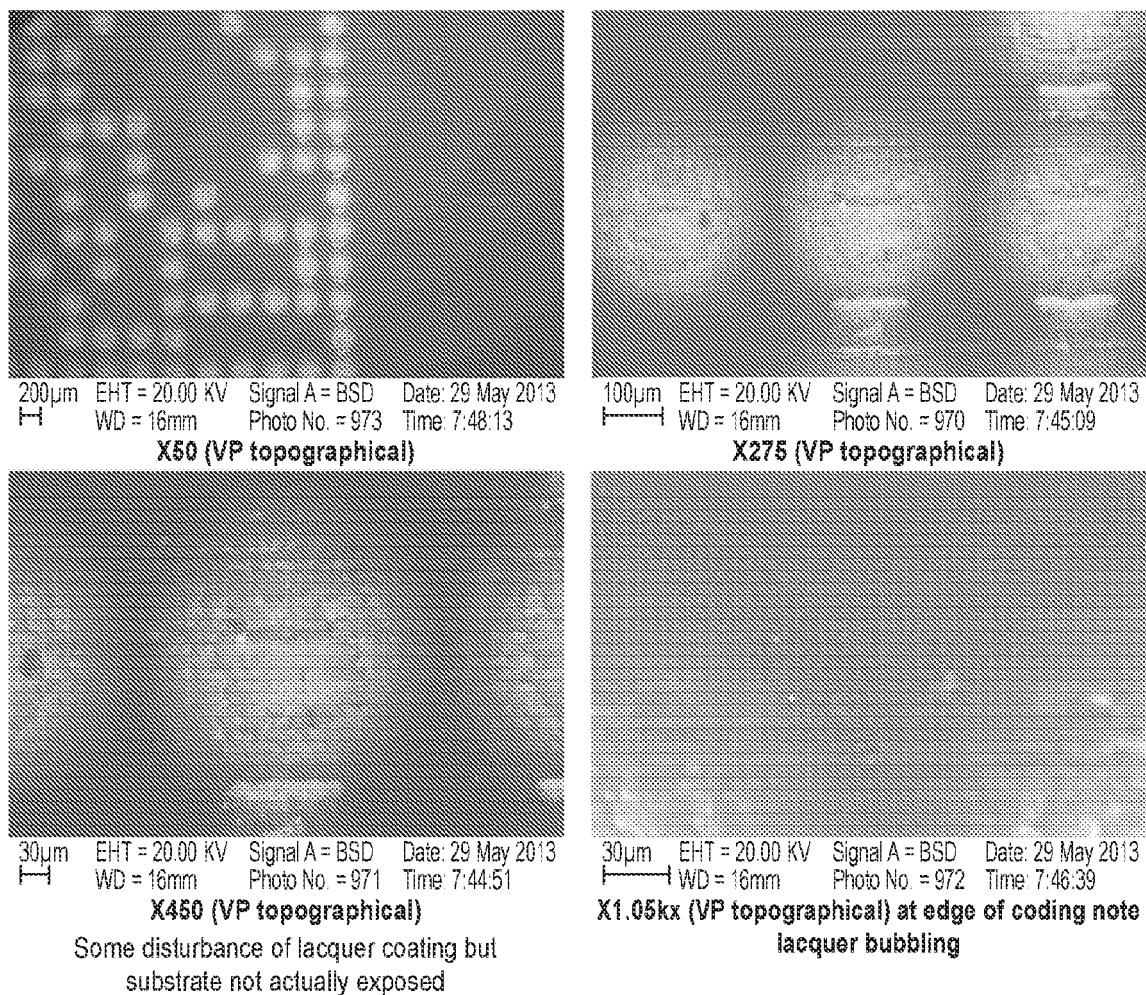


FIG. 4

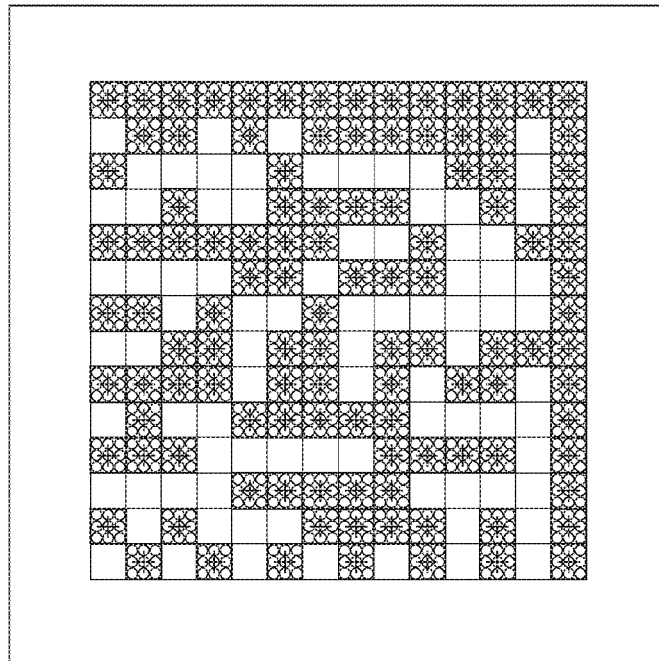


FIG. 5A

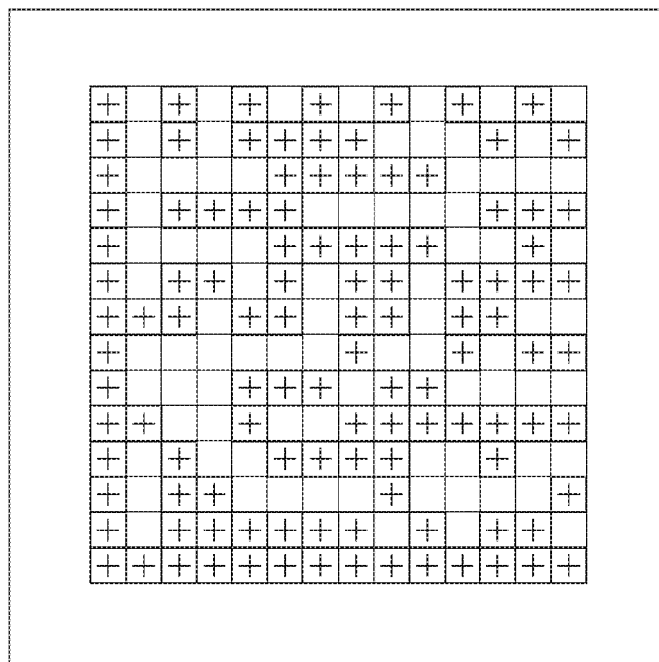


FIG. 5B

REFERENCES CITED IN THE DESCRIPTION

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